soft to touch and looked yellowish green. White incrustations at the posterior lateral side of the abdomen bulged outside. Larvae pupated inside a cocoon constructed by joining two to three leaves together or in between rice stems. Inside the cocoon the pupa was covered by white dust possibly produced by the four pairs of posterior encrustations. Freshly formed pupae were yellowish green and changed to brownish colour afterwards.

Parasites: The following parasites were reared from the field collected larvae of *P. naso*, *Apanteles* sp. incogn., *Apanteles* sp., *Charops bicolor* and *Argarophylax* sp. The following pupal parasites were reared from pupae of *P. naso*, *Thecocarcelia oculata* Baranov, *Brachymeria* sp. nr. *lasus* Walk., *Ischnojoppa luteator* Fabr. and *Xanthopimpla* sp.

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Central Rice Research Institute,
Cuttack-753 006, Orissa, India.
August 13, 1985.

V. N. RAO
K. S. BEHERA

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28. DISTRIBUTION OF *DROSOPHILA* SPECIES INHABITING THE TROPICAL RAIN FORESTS OF SAMPAJE GHATS (COORG DISTRICT), KARNATAKA, SOUTH INDIA

Introduction

Judging from the reports on the occurrence and the pattern of distribution on the members of the genus *Drosophila* from other parts of the world it appears that only little has has been done in the Indian sub-continent. Inspite of the considerable progress made during the past few years (Parshad and Paika 1964, Parshad and Duggal 1965, 1966; Rehman and Singh 1969, Gupta and Ray Chaudhuri 1970, Singh 1970, Jha, Mishra and Singh 1971, Reddy and Krishnamurthy 1971, 1974, 1977; Vaidya and Godbole 1971, 1972, 1973, 1976; Ranganath and Krishnamurthy 1972, Gupta 1973, 1974; Gupta and Singh 1977, Prakash and Reddy 1978) information pertaining to the occurrence and pattern of distribution of the members of the genus *Drosophila* in different eco-geographical regions of the country is not clearly known. For instance many parts of the tropical rain forests of western ghats still await exploration. In view of this, Sampaje ghats near Madikeri, Coorg district (a part of western ghats) has been chosen to get an insight into the *Drosophila* species inhabiting this region. The complex natural habitats of the tropical rain forests of this area with

diverse plant species provide most congenial natural environs for the colonization by members of the genus *Drosophila*. The detailed account of the collection data and the distributional pattern of different species inhabiting Sampaje ghats are presented here.

Materials and Methods

Drosophila survey was carried out at 15 different sites having variable altitudes ranging from 300-1200 metres, along the mountainous slopes of Sampaje ghats. Flies were collected by usual banana bait technique using about ten 250 ml milk bottles at each site.

The flies which are attracted by the fermenting banana were etherised, categorised and the number of each species were recorded. The individual females that could not be identified were isolated into separate media vials. The progenies of such single gravid females were used for detailed morphological, anatomical and cytological investigations to assign them to their respective groups.

Observations

A total of 2340 flies comprising 24 species were collected, of which 23 belong to the genus *Drosophila* and one to the genus *Scaptomyza*. The members of the genus *Drosophila* are represented by three sub-genera namely *Sophophora*, *Drosophila* and *Scaptodrosophila*, of which majority of them belong to either *Sophophora* or *Drosophila* comprising nearly 98.8% of the total population. While only two species, namely *D. meijerei indicus* and *D. mundagensis* are represented by 2 and 10 individuals belonging to *Scaptodrosophila*. Of the remaining 21 species, 17 species belong to the sub-genus *Sophophora* comprising nearly 55.7% of the total population and only 4 species comprising of about 43.1% belong to the sub-genus *Drosophila*. Among the members of the genus *Drosophila* only four species *D. malerkotliana* (24.7%), *D. takahashii* (13.5%), *D. nasuta* (19.9%), *D. immigrans* (19.3%), comprise nearly 77.4% of the total population. While the other species such as *D. bipectinata* (3.8%), *D. anomelani* (2.4%), *D. jambulina* (1.4%), *D. nagarholensis* (2.1%), were found in moderate numbers and contribute about 9.8% to the total population. The remaining 11.6% of the total population is shared by 15 species represented by a few individuals. Of the 24 species collected 4 species, *D. sampajensis*, *D. cauverii*, *D. madikerii* and *D. gangothrii* were new and have been described by us (1980, in press).

The relative abundance of each species encountered in the collections and their distributional pattern along with the altitudes of the collection sites are shown in Table 1. The species composition and the relative numbers of different species in the sites under study vary a great deal inspite of the similarities in the environmental factors such as temperature, humidity, rainfall, vegetation availability of food etc. Perusal of the table reveals that only 4 species, *D. malerkotliana*, *D. takahashii*, *D. nasuta* and *D. immigrans* occurred in almost all the sites in considerable numbers, while the other species were found in small numbers and are sparsely distributed.

Discussion

Members of the genus *Drosophila* are cosmopolitan in distribution. However the pattern of distribution depends not only on several ecological factors but also on the colonizing or invasive abilities of the species. Since the environment is not uniform in space and time the numerical variation of different species and their relative abundance in a given area is a common feature. The *Drosophila* investi-

TABLE 1

DISTRIBUTION OF DIFFERENT SPECIES OF *Drosophila* IN SAMPAJE GHATS (COORG DISTRICT), KARNATAKA

LOCALITIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
Altitude in Meters	300	300	350	400	450	500	600	800	950	950	1000	1000	1050	1100	1200	
1. *D. ananassae*	—	6	—	—	—	—	—	—	—	—	—	—	—	—	—	6
2. *D. anomelani*	—	—	—	12	—	25	—	7	—	—	—	4	—	—	—	48
3. *D. bipectinata*	—	5	—	22	—	15	18	—	8	—	10	1	—	14	—	93
4. *D. eugracilis*	4	—	10	—	2	—	—	4	—	—	—	—	—	—	—	20
5. *D. giriensis*	—	—	—	2	—	8	—	5	—	—	—	—	—	—	—	15
6. *D. jambulina*	—	5	8	—	4	3	—	6	—	—	7	—	—	—	—	33
7. *D. mysorensis*	—	—	—	—	—	—	3	—	—	—	—	2	—	—	—	5
8. *D. malerkotliana*	46	82	35	48	45	—	37	25	34	88	—	60	32	28	20	580
9. *D. pseudoananassae*	—	2	—	6	—	3	—	—	4	—	—	—	—	—	—	15
10. *D. punjabiensis*	—	2	—	1	—	—	4	—	—	—	—	—	—	—	—	7
11. *D. nagarholensis*	1	4	—	10	—	7	—	9	—	—	—	14	—	—	4	49
12. *D. suzukii*	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1
13. *D. takahashii*	32	40	45	—	36	—	52	—	—	37	22	11	—	35	6	316
14. *D. cauverii**	—	—	—	1	4	—	11	—	—	10	—	—	—	—	—	26
15. *D. sampajensis**	4	—	—	10	—	14	—	1	—	—	3	—	—	—	—	32
16. *D. madikerii**	—	—	—	—	—	—	4	6	—	10	—	14	—	—	10	44
17. *D. gangothrii**	—	—	—	—	2	—	—	—	9	—	3	—	7	—	—	21
18. *D. nasuta*	31	20	40	35	38	5	33	42	30	42	31	17	28	35	39	466
19. *D. neonasuta*	—	—	—	—	—	—	1	—	—	—	4	—	—	—	—	5
20. *D. immigrans*	10	20	40	30	35	28	25	22	34	32	38	25	34	32	48	453
21. *D. nigra*	—	—	—	6	—	—	—	10	14	7	16	23	—	4	12	92
22. *D. meijeri indicus*	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	2
23. *D. mundagensis*	—	—	—	—	—	—	—	—	6	—	—	—	4	—	—	10
24. *D. captomyza*	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
Total number of individuals	128	186	178	183	167	108	188	137	139	228	135	171	105	148	139	2340
Total number of species	7	10	6	12	9	9	10	11	8	8	10	10	5	6	7	

* New species.

gation made in the vast unexplored area of Sampaje ghats (Western ghats) throws some light not only on the pattern of distribution but also on their dependance on the tropical rain forests. For instance the 15 sites with variable altitudes having more or less similar habitats reveal considerable differences in the species composition as well as in the relative abundance of different species. This may be partly ascribed to the differences in the altitudes and partly to the unknown micro-environmental factors in which the sites differ as well as to the intrinsic abilities of the species to colonize.

Analysis of the *Drosophila* sample reveals that even though many species could be collected, only 4 species, *D. immigrans, D. nasuta D. malerkotliana* and *D. takahashii* were found to be present in almost all the sites in considerable numbers, indicating their ecological dominance over other species. Further, other species such as *D. pseudoananassae, D. jambulina, D. mysorensis, D. bipectinata, D. nigra, D. mejeri indicus* which were reported occassionally in the plains (Reddy and Krishnamurthy 1974) were found to occur more or less frequently in the tropical rain forests indicating the availability of favourable breeding sites for their colonization. In addition several species such as *D. anomelani, D. eugracilis, D. giriensis, D. punjabiensis, D. nagarholensis, D. suzukii* and *D. mundagensis,* which were not reported from the orchards and gardens of the peninsular India occurred in the tropical rain forests indicating the dependence of these species on the forest type of vegetation. *D. ananassae,* a common domestic species on the plains were found absent in almost all the sites except a few individuals at one site indicating its lack of competence to colonize in the tropical rain forests.

Another interesting feature in the *Drosophila* fauna of the tropical rain forests of Sampaje ghats is the finding of four new species *D. sampajensis, D. cauverii, D. madikerii* and *D. gangothrii* which have been described by us (1980, in press). In view of this, the *Drosophila* fauna of Sampaje ghats is of special interest and value as it offers a rich variety of species.

The most noteworthy feature of the *Drosophila* fauna of Sampaje ghats is in its dominance of the members of the *melanogaster* and *immigrans* species groups belonging to 2 sub-genera, *Sophophora* and *Drosophila* respectively. Such sympatric association and ecological dominance of the members of 2 species groups in the area under investigation is in confirmity with the findings of Reddy and Krishnamurthy (1974, 1977), Prakash and Reddy (1978) and also with the suggestion of Bock and Wheeler (1972). Incidentally the finding of 4 new species belonging to the *melanogaster* species group from this area corroborates with the suggestion of Bock and Wheeler (1972) who regarded the Indian sub-continent as the general area for the origin and wide speciation of *melanogaster* species group.

The diversity in the species composition as well as the finding of four new species in the area under study indicate that the *Drosophila* fauna of Sampaje ghats is exceedingly more complex than that of other habitats in the plains of peninsular India. In view of this it is felt that the Sampaje ghats with its luxuriant flora offer a variety of natural environs for colonization by the members of the genus, *Drosophila.*

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Department of Post-Graduate Studies
and Research in Zoology,
University of Mysore,
Manasagangothri, Mysore 570 006,
India,
January 2, 1981.

N. MUNIYAPPA
G. SREERAMA REDDY

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